Replace Compressor Cylinder Unloaders

NaturalGas EPA POLLUTION PREVENTER

Partner Reported Opportunities (PROs) for Reducing Methane Emissions

PRO Fact Sheet No. 110

Applicable sector(s):

☐ Production ☐ Processing ■ Transmission and Distribution

Partners reporting this PRO: Great Lakes Gas Transmission

Other related PROs: Automate Systems Operation to Reduce Venting, Lower Purge Pressure for Shutdown, Replace Gas Starters with Air

Compressors/Engines	■
Dehydrators	□
Pipelines	□
Pneumatics/Controls	□
Tanks	□
Valves	□
Wells	□
Other	□

Technology/Practice Overview

Description

Compressor cylinder unloaders are used to 1) reduce the machine's start-up load, 2) prevent an overload when there is an upset in operating conditions, and 3) control gas volumes due to fluctuations in rate requirements. Many older reciprocating engine-powered compressors are equipped with outdated or worn cylinder unloaders that continuously leak natural gas even when regularly maintained. One partner initiated a project to replace the cylinder unloaders at some of its compressor stations with a design that utilizes a balanced piston that avoids chatter and minimizes the pressure required for operation.

Faulty unloaders can be a source of fugitive methane emissions to the atmosphere from leaking o-rings, covers, pressure packing, and frequent maintenance. Unloaders have also been identified as one of the top causes of unscheduled reciprocating compressor shutdowns. The "Head End Deactivator" by Compressor Engineering Corp. of Houston, Texas, utilizes multiple sealing elements to reduce emissions while its plug-type design avoids the inherent operational problems and breakage associated with finger-type unloaders.

Methane Savings: 3.5 MMcf per year per compressor

Costs

Capital Costs (including installation) per engine

☐ <$1,000 ☐ $1,000 – $10,000 ■ >$10,000

Operating and Maintenance Costs (annual) per compressor

■ <$100 ☐ $100-$1,000 ☐ >$1,000 – $10,000

Payback (Years)

■ 0–1 ☐ 1–3 ☐ 3–10 ☐ >10

Benefits

The installation of the new compressor unloaders was approved on the basis of cost effectiveness, design, and safety. The cost of a new unloader is less expensive than repairing the manufacturer equipped original ones. Reduced methane emissions were an associated benefit of the project.

Operating Requirements

Re-piping of control lines and personnel trained in the proper maintenance of the new unloaders.

Applicability

Compressor cylinder unloader replacement is applicable to compressors equipped with original unloaders that are experiencing maintenance problems.

Methane Emissions Reductions

Faulty compressor cylinder unloaders require frequent maintenance and can vent significant methane emissions to the atmosphere. A partner reported that a total of 14 MMcf per year of methane emissions were eliminated by replacing the worn unloaders on four compressors with those of a new design at one of their compressor stations.

Economic Analysis

Basis for Costs and Savings

The partner realized estimated savings in excess of $50,000 per unit per year. The savings include the value of the previously vented gas, reduced safety risks, and maintenance costs. The capital and labor costs to install the unloaders is $40,000 to $50,000 per unit.

Discussion

Payout is in 0 to1 year. Capital costs to replace and install the new unloaders were reported to be $40,000 to $50,000 per unit. However, these costs are justified based on the relatively short pay-back period and reduced O&M costs. Replacement also resulted in fewer unscheduled shutdowns and reduced methane emissions. The partner has plans to replace original unloaders on compressors at other stations.